MONTANA

Forest Pest Conditions and Program Highlights

1991

Report 92-2

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MONTANA FOREST PEST CONDITIONS AND PROGRAM HIGHLIGHTS

1991

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INTRODUCTION

This report summarizes the major insect and disease conditions in Montana during 1991, and was jointly prepared by Timber, Cooperative Forestry, and Pest Management, USDA Forest Service, and Montana Department of State Lands. Information for this report was derived from ground and aerial surveys conducted throughout the State. When available, ownership information is provided.

SUMMARY OF CONDITIONS

Principal agents causing major damage to forests in Montana in 1991 were root diseases, dwarf mistletoes, western spruce budworm and mountain pine beetle.

While the number of acres infested by mountain pine beetle continued to decline, infestations still persisted in 1991 on 160,000 acres, almost entirely lodgepole pine. Western spruce budworm-caused defoliation increased in 1991 to just over 1,607,000 acres. Most of the increase was along the Continental Divide in stands that had been affected by adverse weather in 1989.

Missoula's population of a boxelder defoliator have returned to sub-outbreak levels. Douglas-fir beetle infested 8,035 acres killing approximately 10,600 trees. Pheromone trap catches of Douglas-fir tussock moth increased, but no visible defoliation was reported. No significant forest tent caterpillar or larch casebearer activity was observed. Three gypsy moths were caught in Montana in pheromone traps in 1991. Lodgepole terminal weevil activity was significant in some plantations in western Montana. Continued drought and effects of wide-spread fires of 1988 contributed to an increase in tree mortality from pine engraver beetles. They infested 3,000 acres of ponderosa pine and 5,000 acres of lodgepole pine. Spruce beetle killed only 128 trees on 113 acres. Western balsam bark beetle infestations in subalpine fir increased to 7,300 acres, with 14,000 trees killed. Western pine beetle killed 350 trees on 600 acres.

Root diseases are epidemic on over 1.4 million acres in Montana. Armillaria, Phellinus and annosus root diseases killed approximately 4.2 million pole-size to mature trees (about 40 million cubic feet of timber) across the State; mostly west of the Continental Divide. Damage has increased as stands have matured and as selective harvesting and fire control has shifted stands toward susceptible species. Annosus root disease has become common and very damaging in ponderosa pine stands on the Flathead Indian Reservation and other western Montana locations. Damage is increasing where trees have been selectively harvested providing stumps for new infections. Schweinitzii butt rot was common on Douglas-fir throughout its range.

Dwarf mistletoes were present on about 2.4 million acres, causing about 33,250 thousand cubic feet of timber growth loss. Forest fires in recent years somewhat alleviated problems in burned-over areas particularly in lodgepole pine type. Increases in selective harvesting have increased risk of dwarf mistletoe damage elsewhere in the State.

White pine blister rust caused extensive tree mortality throughout the range of western white pine and prevented management of wild-type western white pine on moderate to high-hazard sites. White pine blister rust is still at epidemic levels in many whitebark pine stands in the State. It has severly limited production of cones in these stands, an important food for grizzley bears. The disease is contributing to the movement to list whitebark pine as a threatened species. Atropellis canker was common in poles and sawtimber. Comandra blister rust was severe in localized areas east of the Continental Divide. Western gall rust caused locally severe tree mortality and top kill. The damage was most significant in young stands. Damage from

Diplodia blight was severe at a number of locations with occasional tree mortality observed. Stem decay fungi have been decreasing in importance as older stands have been harvested or burned. There are still significant losses to these fungi in remaining older stands, particularly lodgepole pine and larch stands. Stem decays continue to cause tree hazards in developed recreation and administrative sites where old growth has significant aesthetic value. Elytroderma disease was chronic in the Bitterroot Valley, the Flathead Indian Reservation and around Flathead Lake. Larch needle disease increased in severity in local areas of western Montana. Lodgepole pine needle cast was widespread but less severe in 1991. Damage from Dutch elm disease continued with the highest losses occurring in Billings and Great Falls. Fusarium was the most common nursery disease problem.

INSECTS

Beetles

Mountain pine beetle

As in past years, the mountain pine beetle remains the most devastating insect pest in the State (Figure 1). Though infested acres continued a decline begun in 1982, the decrease in 1991 was less than in previous years (Figure 2). In 1990, more than 198,000 acres had been infested. In 1991, faders were recorded on only 160,000 acres (Figure 3). Though that total includes all host species, approximately 99 percent of them were lodgepole pines (Table 1). Volume represented by dead trees totaled more than 7,020 MCF. The most active infestations continue to be on the Lolo, Kootenai and Flathead National Forests (NF's) in northwest Montana. There may be a slight decrease in infested area for the next few years; however, much lodgepole pine remains that will grow into a susceptible condition within the next 5 to 10 years.

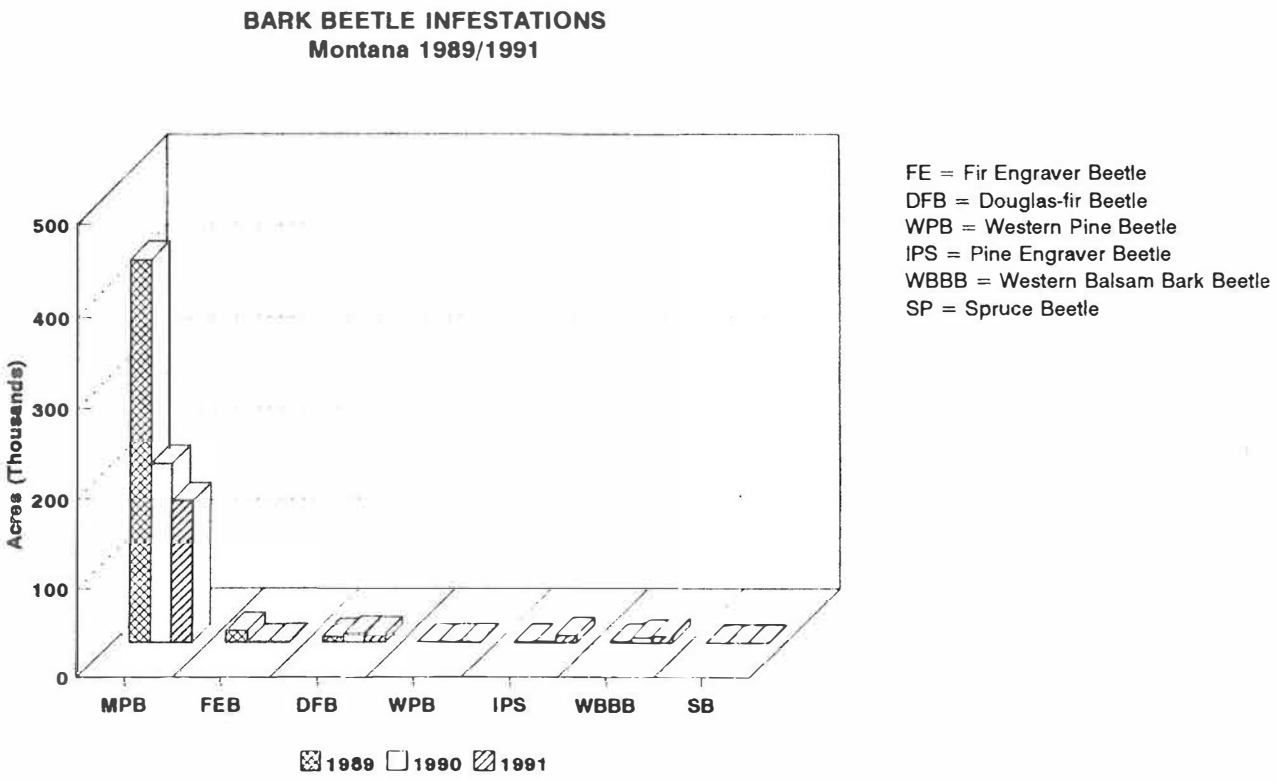


Figure 1.--Bark beetle infestations in Montana from 1989 to 1991.

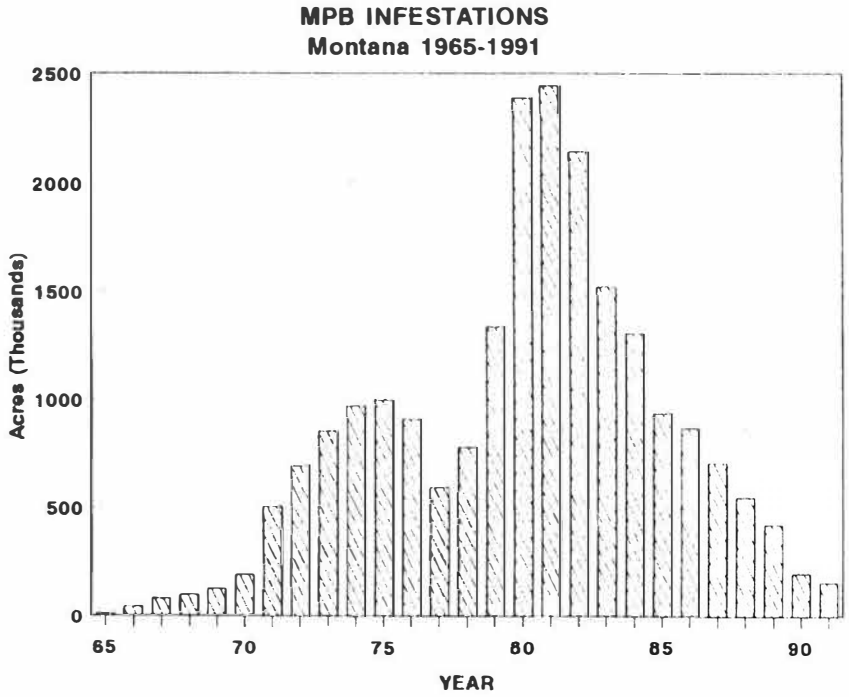
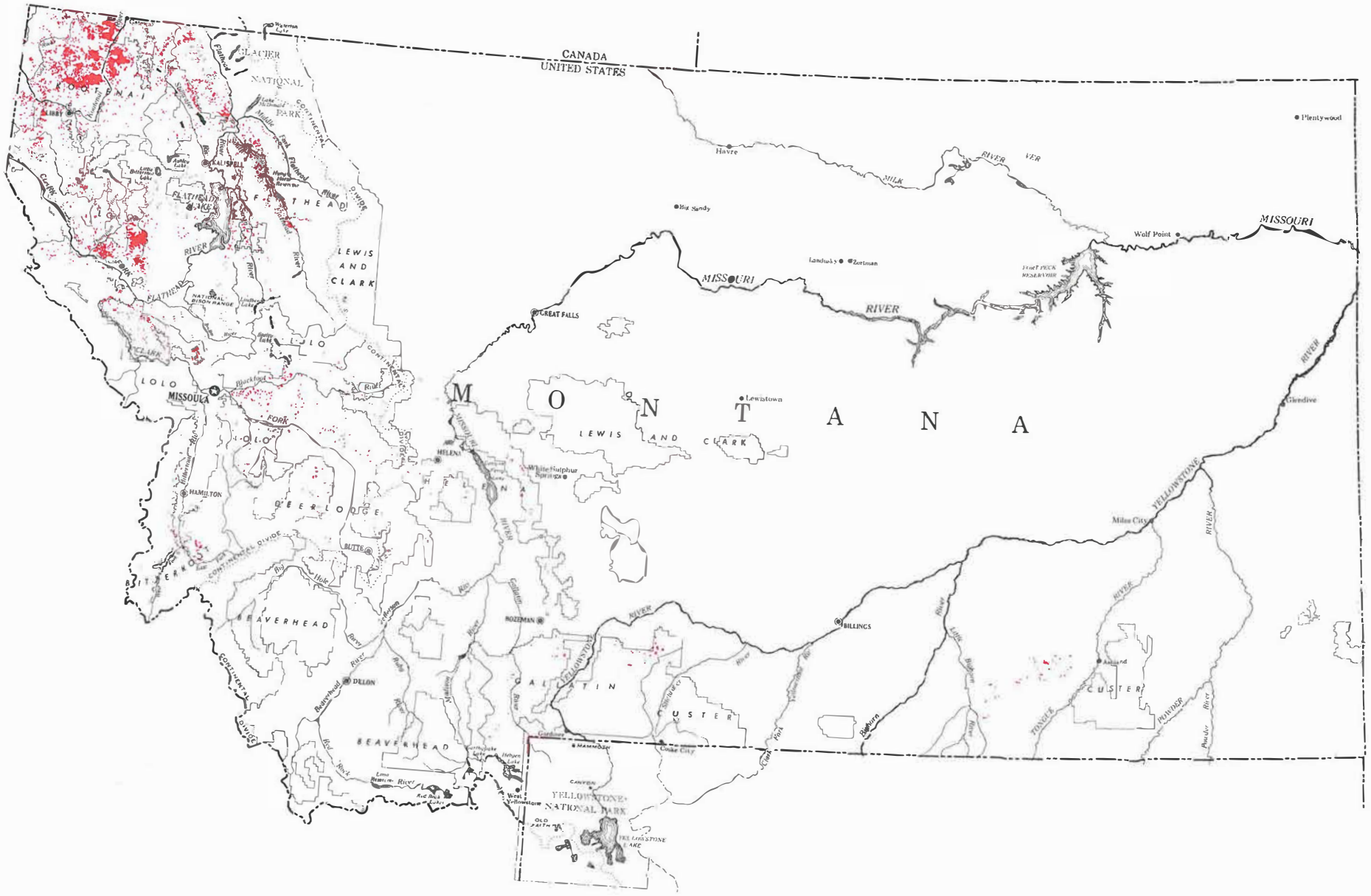


Figure 2.--Mountain pine beetle infestations in Montana from 1965 to 1991.



Areas of mountain pine beetle infestations in Montana and Yellowstone National Park (all host species), 1991.

Table 1.--Acres under Federal jurisdiction in Montana on which MPB-caused mortality was aerially observed, 1990 and 1991.

	1990				1991			
Area	LPP[1]	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead NF	41	-	2	-	489	-	-	-
Bitterroot NF	14	1,505	-	-	18	363	-	-
Custer NF	-	44	18	-	38	-	-	-
Deerlodge NF	852	-	2	-	960	2	-	-
Flathead NF	8,157	14	109	2,124	4,785	28	118	8,349
Gallatin NF	*	*	*	*	1,408	2	101	-
Helena NF	112	34	2	-	509	44	4	-
Kootenai NF	132,858	1,770	105	1,392	104,117	793	4	540
Lewis & Clark NF	8	810	-	-	-	42	-	-
Lolo NF	21,590	1,014	-	43	24,537	188	6	119
Total NF	**163,632**	**5,191**	**238**	**3,559**	**136,861**	**1,462**	**233**	**9,008**
Crow IR	-	216	-	-	-	44	-	-
Flathead IR	1,194	334	2	-	893	145	-	2
N. Cheyenne IR	-	-	-	-	-	40	-	-
Rocky Boy's IR	4	28	-	-	*	*	*	*
BLM (Total)	22	46	2	-	141	14	2	13
Total (Non-NF)	**1,220**	**624**	**4**	**-**	**1,034**	**243**	**2**	**15**
Total Federal	**164,852**	**5,815**	**242**	**3,559**	**137,895**	**1,705**	**235**	**9,023**

[1]LPP = Lodgepole pine; PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine
* Not flown.

Table 2.--Acres of State and private ownership (within the following reporting areas) in Montana on which MPB-caused mortality was aerially observed, 1990 and 1991.

	1990				1991			
Area	LPP[1]	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead NF	11	-	-	-	16	-	-	-
Bitterroot NF	-	3,092	-	-	2	1,051		
Custer NF	-	2	-	-	2	-	2	
Deerlodge NF	152	-	-	-	304	-	-	-
Flathead NF	928	60	2	129	301	106	-	114
Gallatin NF	*	*	*	*	111	-	-	-
Helena NF	78	112	-	-	38	53	-	-
Kootenai NF	8,981	439	-	22	3,184	146	-	12
Lewis & Clark NF	23	78	-	-	-	51	-	-
Lolo NF	2,561	1,185	-	-	3,089	278	-	-
Stillwater SF	4,415	-	-	172	461	30	-	988
Swan River SF	8	2	-	50	22	-	-	204
Thompson River SF	1,004	115	-	-	366	38	-	-
Garnets	10	723	-	-	24	233	-	-
Total	**18,171**	**5,808**	**2**	**373**	**7,920**	**1,986**	**2**	**1,318**

[1]LPP = Lodgepole pine; PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine

Douglas-fir beetle

Once again, total area affected by Douglas-fir beetle declined Regionwide (Figures 1 and 4). There were, however, some notable increases in infestation extent and intensity on some Forests (Table 3 and 4). The total infested area remained almost static--9,125 acres in 1990; 8,051 acres in 1991. On the Gallatin NF, area infested increased significantly. Throughout affected stands approximately 10,600 trees were killed. Volume killed was estimated to be 620 MCF. Because of still-dry conditions in eastern Montana, and late-season fires, Douglas-fir beetle populations may increase in some parts of the State in 1992.

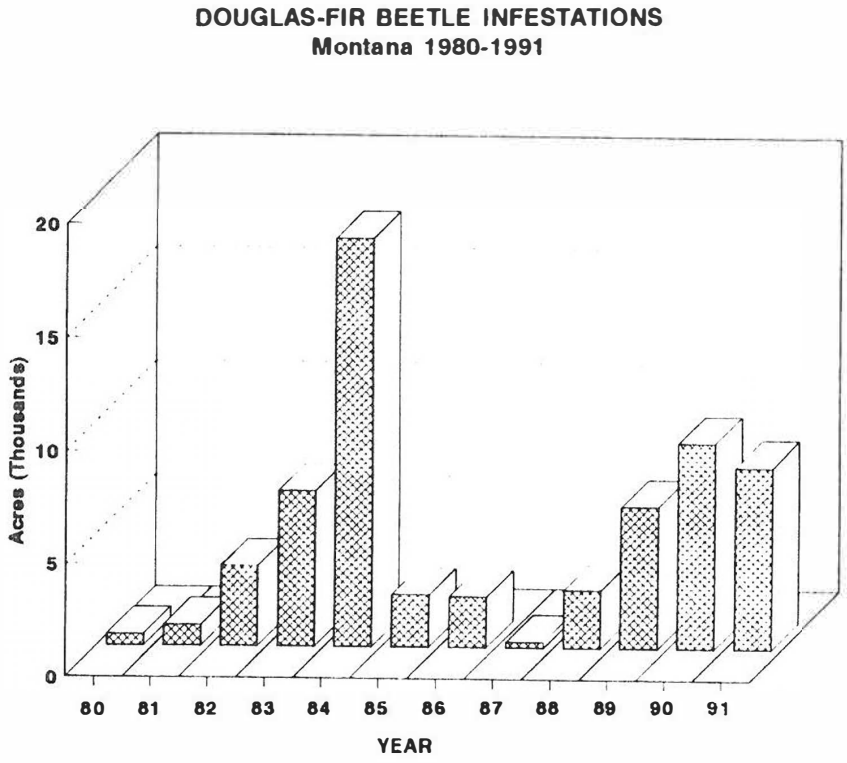


Figure 4.--Douglas-fir beetle infestations in Montana from 1980 to 1991.

Table 3.--Bark Beetle-Infested Acres (Other than Mountain Pine Beetle) in Montana and Yellowstone National Park--1991.

	Douglas-Fir Beetle		Engelmann Spruce Beetle		Pine Engraver Beetle		Western Pine Beetle		Western Balsam Bark Beetle		Fir Engraver Beetle	
Reporting Area	Fed.	S&PF	Fed.	S&PF	Fed.	S&PF	Fed.	S&PF	Fed.	S&PF	Fed.	S&PF
Beaverhead NF	947	448	-	-	368	8	-	-	3,196	267	23	-
Bitterroot NF	1,654	116	-	-	-	16	50	40	53	-	4	2
Custer NF	-	2	-	-	-	39	-	-	-	6	-	-
Deerlodge NF	144	21	55	-	1,895	-	-	-	534	-	18	2
Flathead NF	730	40	35	-	-	-	6	10	331	10	75	15
Gallatin NF	413	771	-	-	2,833	110	-	-	1,699	299	-	-
Garnets	60	176	-	-	-	-	4	22	10	2	-	-
Helena NF	17	18	2	-	-	-	36	78	137	63	-	-
Kootenai NF	432	41	13	2	2	-	14	6	46	2	12	-
Lewis & Clark NF	-	-	-	-	1,286	116	-	-	106	-	-	-
Lolo NF	1,610	165	-	-	2	-	54	44	467	12	176	6
Flathead IR	80	-	2	-	127	-	222	-	16	-	149	-
N. Cheyenne IR	-	-	-	-	1,295	-	-	-	-	-	-	-
Stillwater SF	-	-	4	-	-	-	-	-	-	4	-	6
Swan River SF	-	111	-	-	-	-	-	-	-	-	-	6
Thompson River SF	-	57	-	-	-	-	-	16	-	2	-	34
TOTAL	6,087	1,964	111	2	7,808	289	386	216	6,640	667	457	71

Table 4.--Aerially observed infested acres and mortality attributed to DFB in Montana by reporting area, 1990 and 1991.

	1990			1991		
Reporting Area	Acres	Trees	Vol. (MBF)	Acres	Trees	Vol. (MBF)
Beaverhead NF	3,012	2,561	512.2	1,395	1,607	321.4
Bitterroot NF	2,769	2,920	876.0	1,770	2,947	884.1
Custer NF	4	9	1.8	2	20	4.0
Deerlodge NF	45	38	7.6	165	176	35.2
Flathead NF	194	302	90.6	770	774	232.2
Gallatin NF	*	*	*	1,183	1,210	242.0
Helena NF	12	18	3.6	35	114	22.8
Kootenai NF	1,240	991	297.3	472	616	184.8
Lewis & Clark NF	2	10	2.0	-	-	-
Lolo NF	1,546	1,446	433.8	1,775	2,475	742.5
Swan River SF	127	140	42.0	111	155	46.5
Thompson River SF	8	10	3.0	57	146	43.8
Flathead IR	117	225	67.5	80	153	45.9
Garnets	49	130	39.0	236	327	98.1
Total	**9,125**	**88,000**	**2,378.4**	**8,051**	**10,720**	**2,903.3**

*Not flown.

Western pine beetle

Conditions remained virtually the same in 1991 as in 1990-350 trees killed on 600 acres (Figures 1 and 5). Most mortality was observed in relatively small, scattered (5- to 10-tree) groups. Because of improved moisture conditions in northern Idaho and western Montana, western pine beetle has returned to a nearly endemic status.

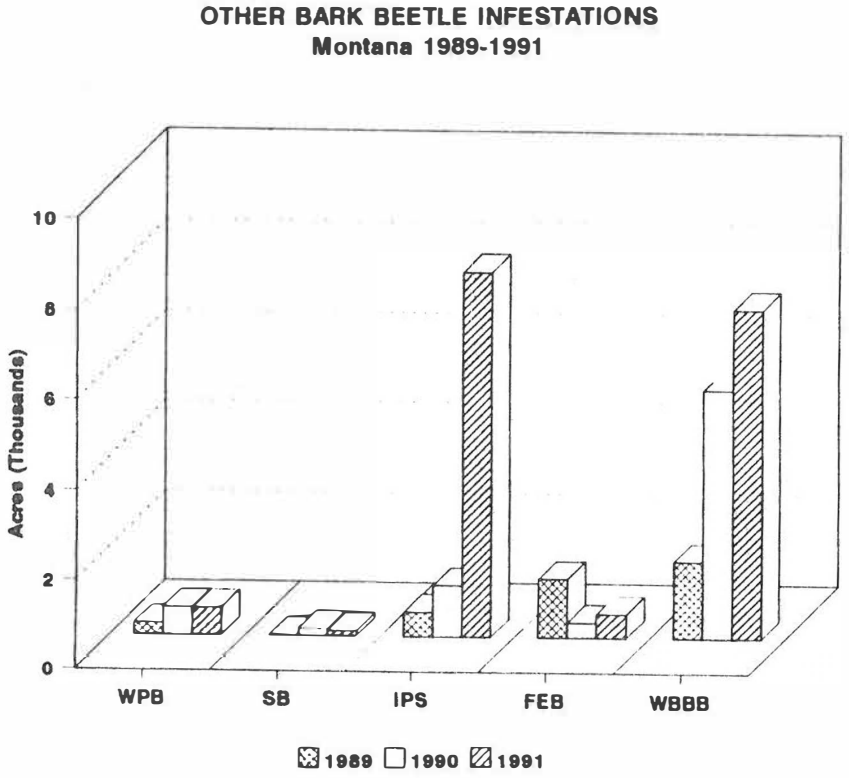


Figure 5.--Other bark beetle infestations in Montana from 1989 to 1991.

Spruce beetle

Only 128 trees were killed by the spruce beetle on 113 acres in Montana during 1991 (Figures 1 and 5). All were recorded in small, widely scattered groups- a condition not conducive to population buildups. No major change is expected in 1992.

Pine engraver beetle (Ips)

A continuation of dry conditions in the eastern Montana, and the lingering effects of wide-spread fires in 1988, resulted in increased mortality in both ponderosa and lodgepole pine stands by the pine engraver beetle (Figures 1 and 5). More than 3,000 acres were affected in the ponderosa pine type-much on the Northern Cheyenne Indian Reservation and adjacent Custer NF. An additional 5,000 acres of mortality were recorded in lodgepole pine stands-the majority of which was on the Gallatin NF adjacent to Yellowstone National Park, and in the Park itself. In both species, more than 6,500 trees were killed.

Fir engraver beetle

Responding to more nearly normal precipitation for the third consecutive year, fir engraver beetle populations remined at a low level in 1991 (Figures 1 and 5). Less than 655 trees were recorded killed on 520 acres. That is a small increase from infested acres observed in 1990.

Western balsam bark beetle

Infested acres once again increased on the Gallatin and Beaverhead NF (Figures 1 and 5). Statewide, predominantly in the western portion, the infested area increased from 5,500 acres last year to 7,300 in 1991. More than 14,000 trees were recorded as killed by this beetle-which we now believe is a complex of pests, of which western balsam bark beetle is perhaps the most obvious.

Lodgepole terminal weevil

Lodgepole terminal activity remained significant in small, localized lodgepole pine plantations. It is not of major importance throughout the State at the present time.

Defoliators

Western spruce budworm

Budworm-caused defoliation increased from 1,482,417 acres in 1990 to just under 1,600,000 in 1991 (Figure 6 and Table 5). Most of this increase occurred along the Continental Divide in stands damaged by cold temperatures in January of 1989 (Figure 7). Budworm populations on the Helena, Lewis & Clark, and Deerlodge NF continue to build, but they have not yet reached their pre-1989 levels. Winter storm effects may be greater than once thought. Population recovery in these areas has been slower than expected.

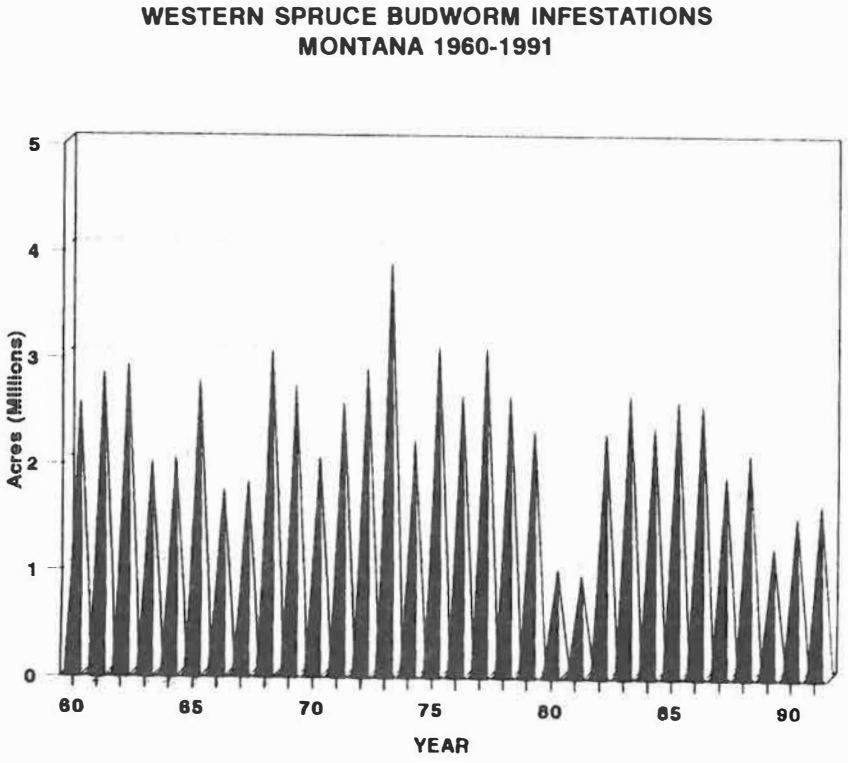
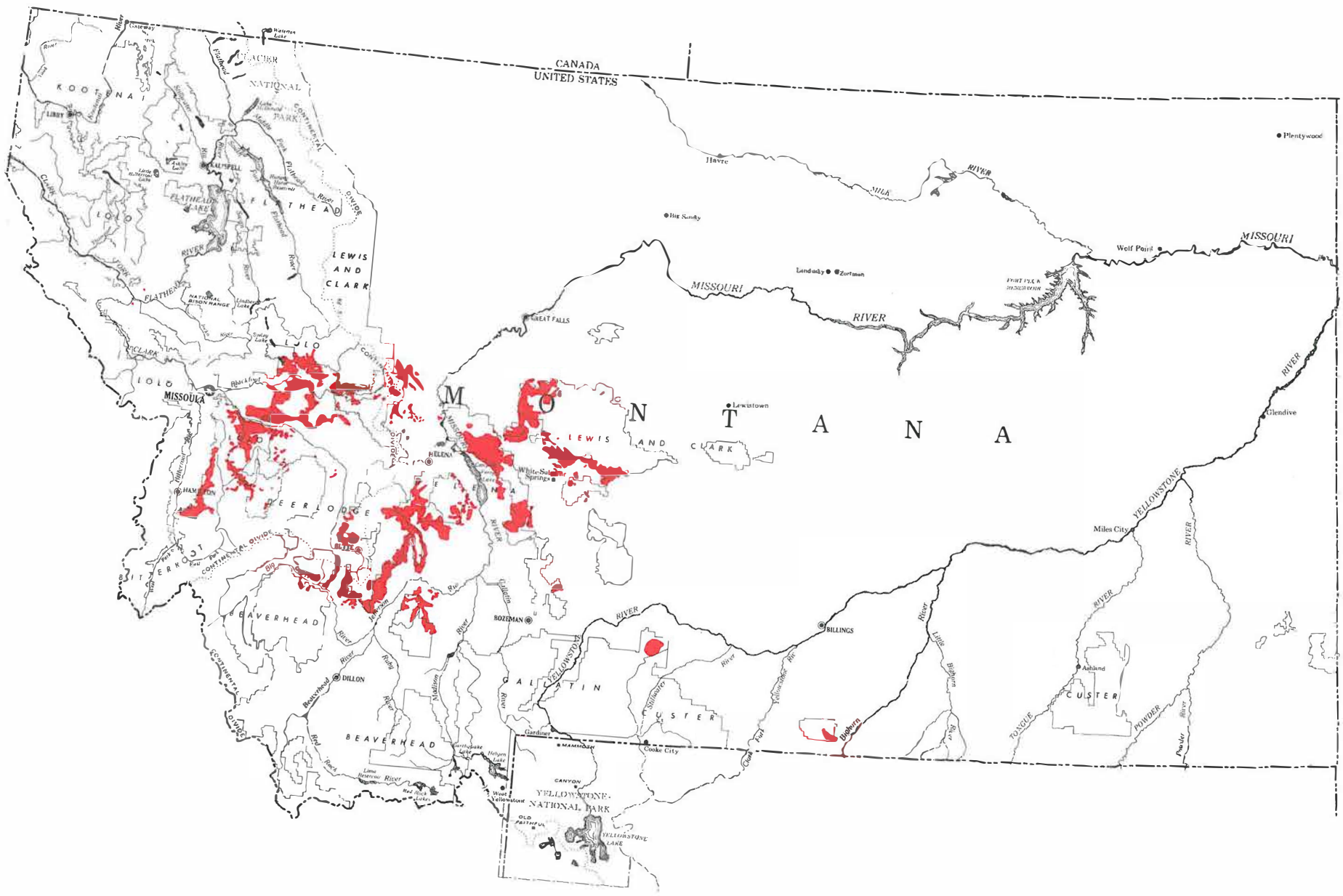


Figure 6.--Western spruce budworm infestations in Montana from 1960 to 1991.

Table 5.--Acres of Visible Western Spruce Budworm Defoliation on all Ownerships in Montana-1990 and 1991.

	All Ownerships		1991 Acres by Ownership			
Reporting Area	1990	1991	NFS	BLM	State	Private
Beaverhead NF	60,064	26,725	15,769	7,991	517	2,448
Bitterroot NF	377,769	276,085	207,819	2,182	19,007	47,077
Custer NF	0	8,782	0	2,461	0	6,321
Deerlodge NF	298,881	356,065	149,517	60,536	15,557	130,455
Flathead IR	80	55	-	-	-	55
Gallatin NF	*	30,932	24,074	0	0	6,858
Garnets	321,891	165,828	0	30,465	34,821	100,542
Helena NF	212,790	331,489	190,377	12,899	6,460	121,754
Lewis & Clark NF	120,231	210,039	127,348	10,211	8,002	64,478
Lolo NF	90,711	189,569	97,069	12,903	17,837	61,759
TOTAL	1,482,417	1,595,724	811,973	139,639	102,201	541,747

* Area not surveyed in 1991.



Western spruce budworm defoliation visible from the air in Montana and Yellowstone National Park, 1991.

Douglas-fir tussock moth

Pheromone baited detection trap counts averaged just over six moths per trap in 1991 (Figure 8). This year will end a decade since the peak trap catch of 1982. If the outbreak cycle repeats as expected, trap counts could average over 30 in 1992. No visible defoliation was reported in 1991, but some defoliation of ornamentals near Flathead Lake may occur this summer.

Gypsy moth

Through several cooperative agreements, land managers within Region 1 deployed over 5,800 pheromone traps as part of an early detection program for the gypsy moth (Figure 9). Traps were concentrated near high-use recreation sites, along major travel routes and most urban areas throughtout the Region. Three moths were caught in Montana. At each trap site with a catch in 1991, trap density will be increased during the next flight period.

Boxelder defoliator

Missoula's populations of *Archips negundanus* have returned to a sub-outbreak level. Only widely scattered spots of very light defoliation were reported in 1991. Activity in 1992 should remain low with little or no defoliation expected.

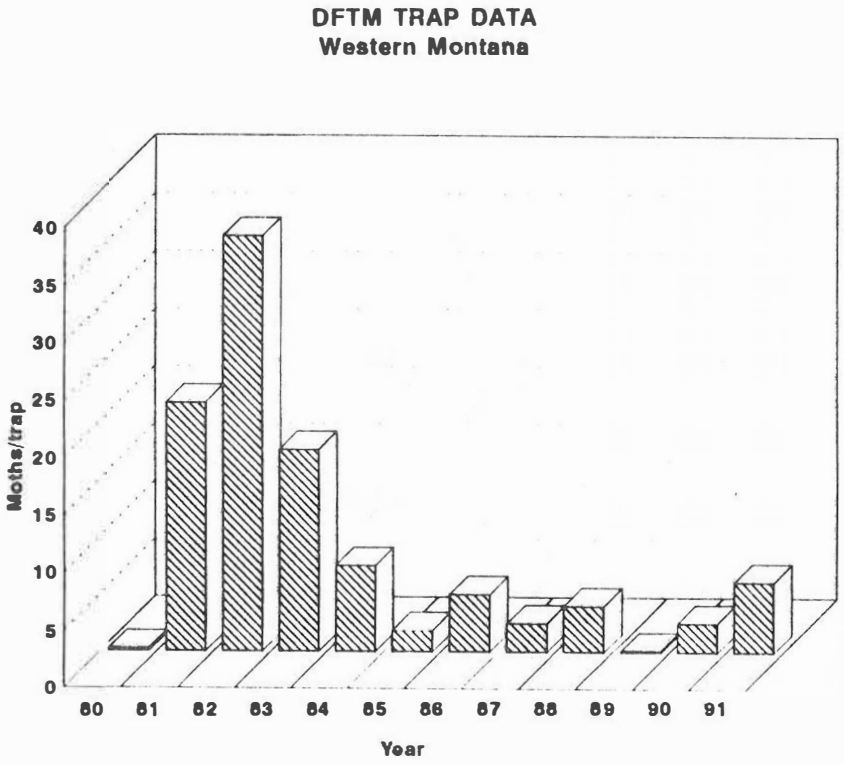


Figure 8.--Douglas-fir tussock moth pheromone trap catches in Montana from 1980 to 1991.

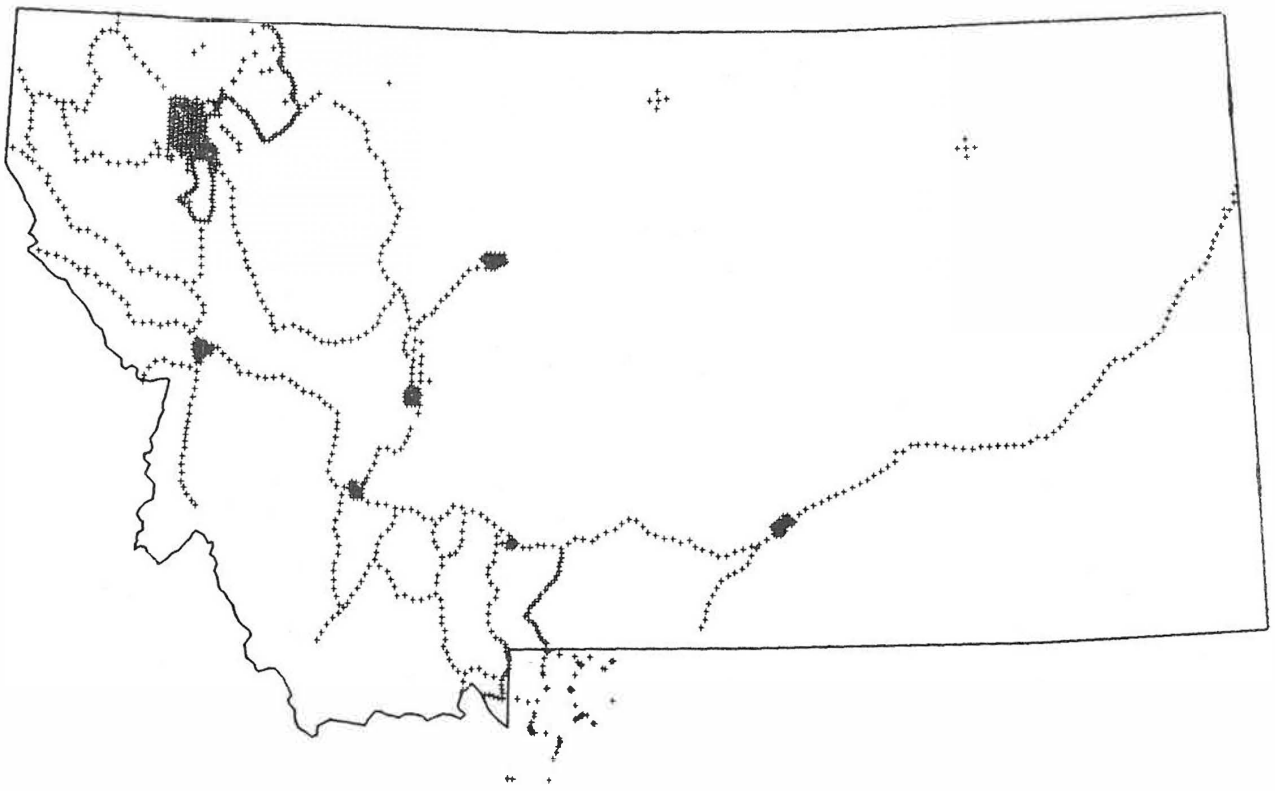


Figure 9.--Gypsy moth pheromone trap locations in Montana and Yellowstone National Park (each + represents one trap).

DISEASES

Disease	Host	Location	Remarks
ROOT DISEASES			Root diseases were among the most damaging pests in the Region. Annually, root diseases cause tree mortality on about 2 million acres in northern Idaho and over 1 million acres in western Montana. Damage has increased greatly since about 1900, due to changing forest conditions.

Annosus root disease *Heterobasidion annosum* (Figure 10)	Douglas-fir, Grand fir, Ponderosa pine, Subalpine fir,	W. Montana	Annosus root disease was common in ponderosa pine stands on the Flathead Indian Reservation and other western Montana locations. The disease is also damaging in Douglas-fir, grand fir and subalpine fir throughout western Montana.

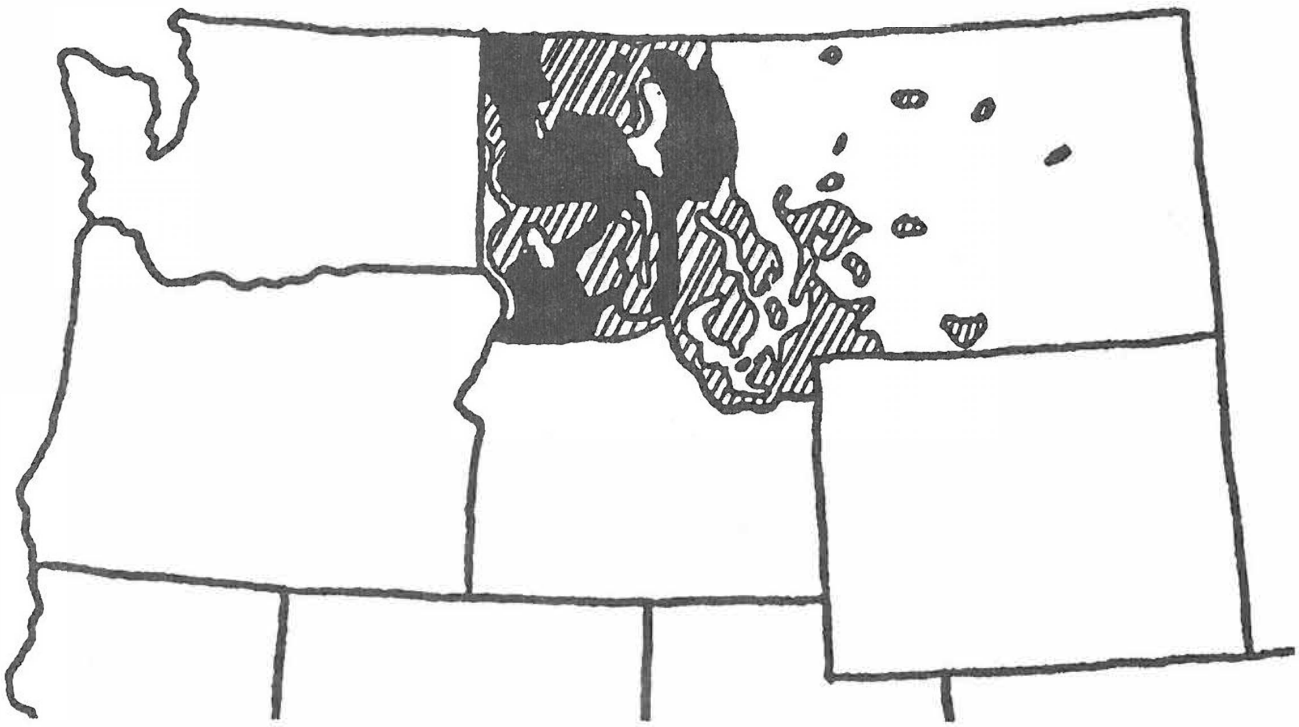


Figure 10.-- ■ Concentrations of *Heterobasidion annosum* damage in the Northern Region.

▨ Distribution of major hosts in the Northern Region.

Armillaria root disease *Armillaria* spp. (Figure 11)	Douglas-fir, Other conifers	W. Montana & north central Montana	Armillaria root disease is epidemic over much of western Montana where Douglas-fir is the primary tree species. Damage is increasing where selective harvest and fire control have increased the proportion of Douglas-fir and true firs in forests.

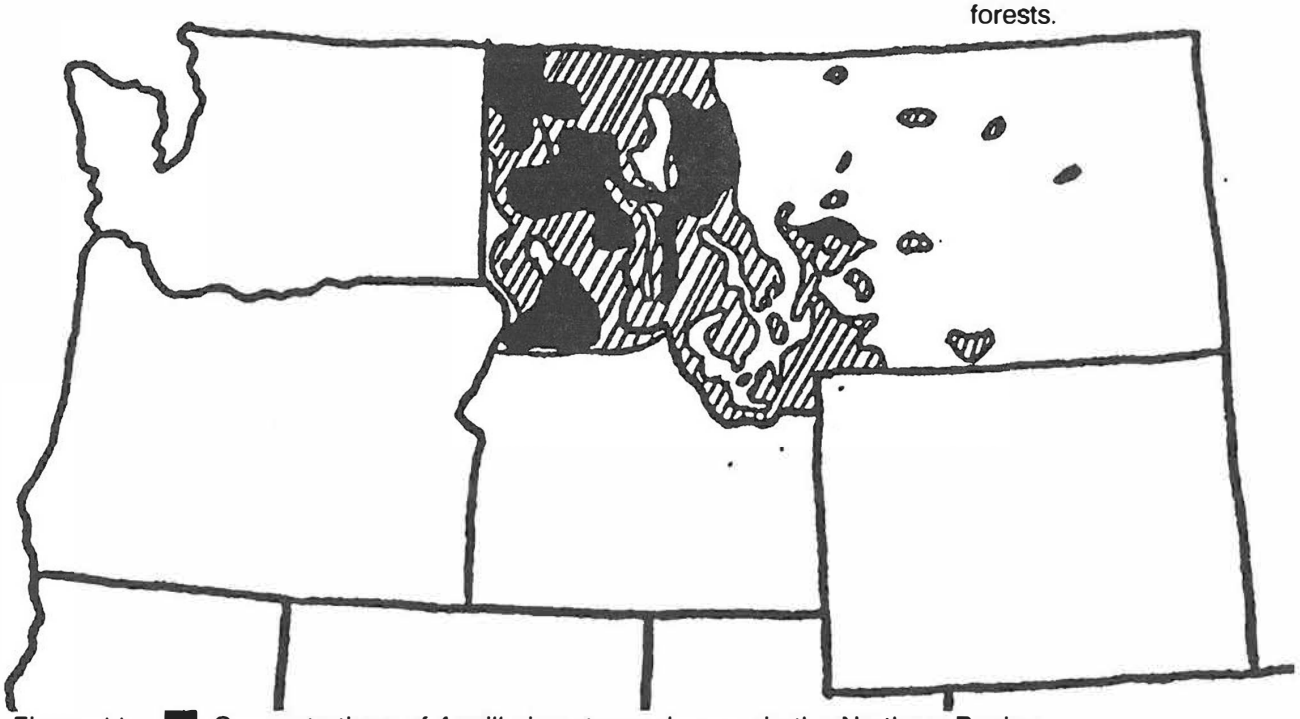


Figure 11.-- ■ Concentrations of *Armillaria ostoyae* damage in the Northern Region.

▨ Distribution of major hosts in the Northern Region.

Laminated root rot *Phellinus weirii* (Figure 12)	Douglas-fir, Grand fir,	Western Montana	Laminated root rot was very severe on parts of the Lolo and Kootenai, National Forests. The increase in damage is attributed to the loss of disease- tolerant western white pine to blister rust, and other factors that have increased the abundance of Douglas- fir and grand fir during the present century.

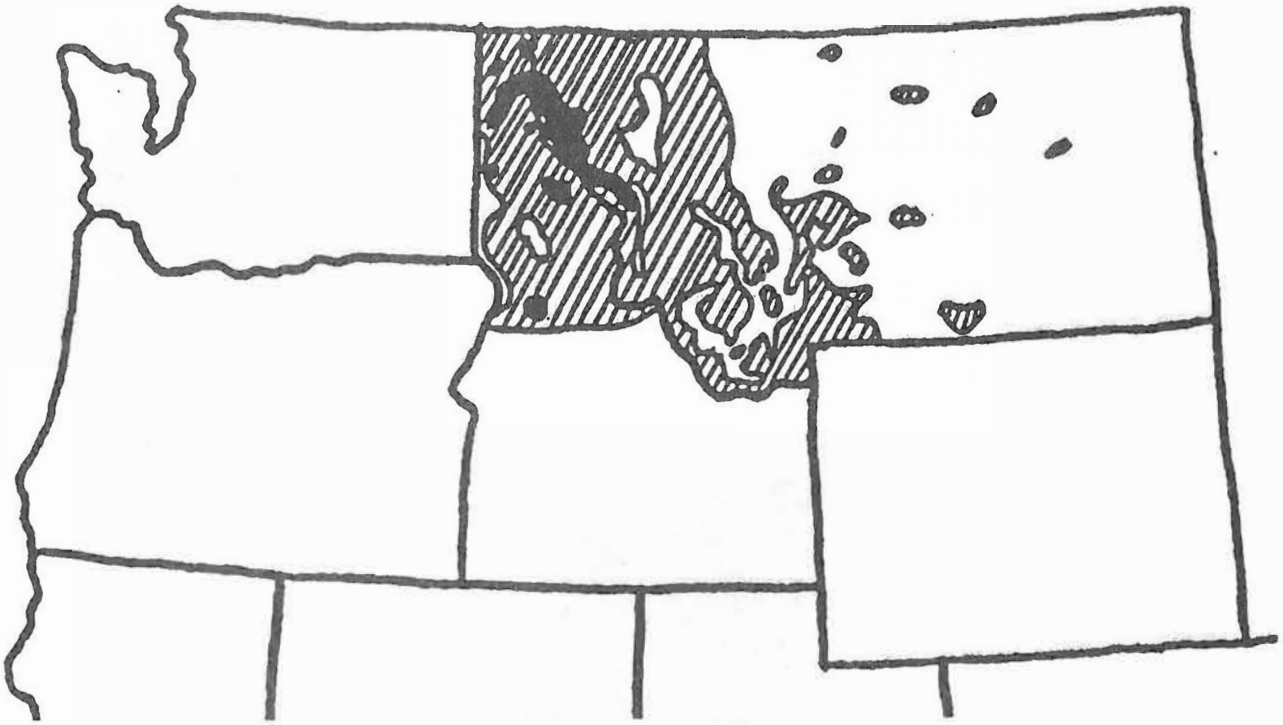


Figure 12.-- ■ Concentrations of *Phellinus weirii* damage in the Northern Region.

▨ Distribution of major hosts in the Northern Region.

Schweinitzii butt rot *Phaeolus schweinitzii* (Figure 13)	Douglas-fir, Other conifers	Throughout range of Douglas-fir	Schweinitzii root and butt rot was common on Douglas-fir, throughout its range. Damage was mainly due to defect and growth loss, rather than mortality, although it is often associated with Douglas-fir beetle attacks.

Figure 13.-- ■ Concentrations of *Phaeolus schweiniitzii* damage in the Northern Region.

▨ Distribution of major hosts in the Northern Region.

DWARF MISTLETOES

Dwarf mistletoes were present on about 2.4 million acres and continued to be one of the major causes of forest damage. Damage changes little from year-to-year. But, over the decades, significant increases have occurred in unmanaged and selectively harvested stands as these pathogens slowly spread and intensify. The desire to leave infected residuals at the time of regeneration complicates dwarf mistletoe management.

Arceuthobium americanum (Figure 14)	Lodgepole pine	Western & central Montana	Lodgepole pine dwarf mistletoe infested 1.6 million acres (33 percent) of the lodgepole type and caused 17 million cubic feet of growth loss.

Figure 14.--Distribution of *Pinus contorta* and *Arceuthobium americanum* in the Northern Region.

Arceuthobium douglasii (Figure 15)	Douglas-fir	Western Montana	Douglas-fir dwarf mistletoe infested 0.4 million acres (16 percent) with Douglas-fir and caused 9 million cubic feet of loss.

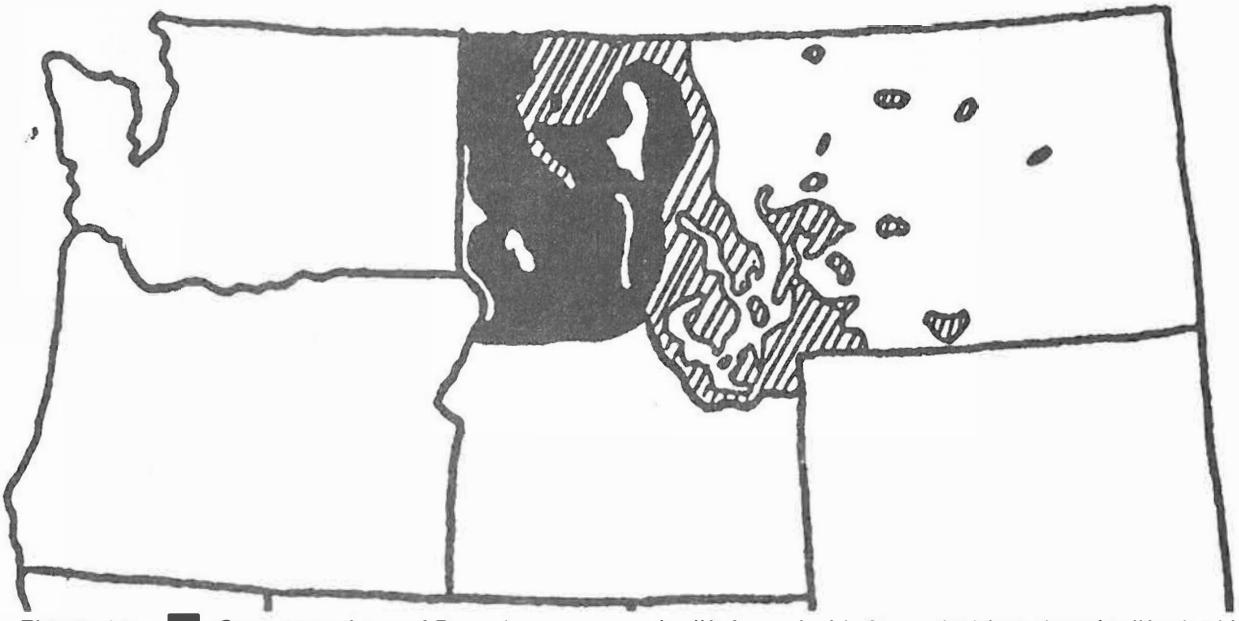


Figure 15.-- ■ Concentrations of *Pseudotsuga menziesii* infested with *Arceuthobium douglasii* in the Northern Region.

▨ Distribution of *P. menziesii* not infested with *A. douglasii* in the Northern Region.

Arceuthobium laricis (Figure 16)	Western larch	Western Montana	Western larch dwarf mistletoe occurred on about 0.4 million acres (30 percent) of western larch stands and caused 7 million cubic feet of loss.

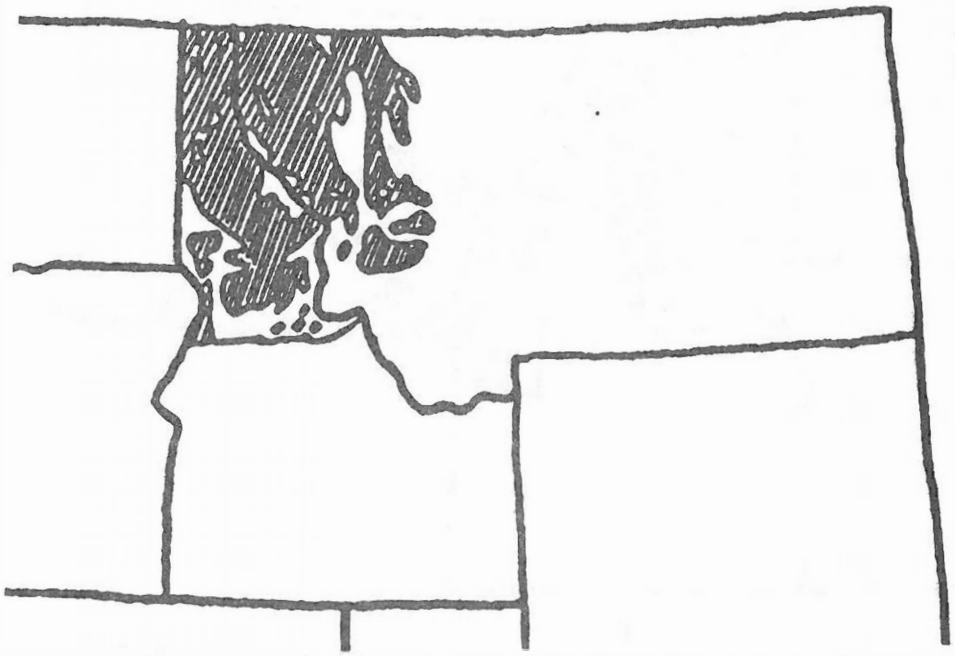


Figure 16.--Distribution of *Larix occidentalis* and *Arceuthobium laricis* in the Northern Region.

CANKER DISEASES

White pine blister rust *Cronartium ribicola*	Western white pine, Whitebark pine	Northwest Montana & west & central Montana	White pine blister rust caused extensive tree mortality throughout the range of western white pine, and and prevented management of wild-type western white pine on high-hazard sites. Increased acreage is successfully regenerated each year with rust-resistant white pine. Whitebark pine, an important food source for grizzly bears, was severely damaged in several locations including, on the Bitterroot NF and in and around Glacier National Park.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Throughout, especially Beaverhead NF	Comandra rust was present on lodgepole and ponderosa pines in many parts of Idaho and Montana. It was especially severe in Montana Forests east of the Continental Divide.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine, Scotch pine	Throughout Montana	Common throughout the range of these pines, this disease caused, stem infections resulting in locally severe tree mortality and top kill. Damage was most significant in young stands.
Atropellis canker *Atropellis piniphila*	Lodgepole pine	Throughout State	Atropellis canker was common in poles and sawtimber, caused defect, top kill, and tree mortality.
Diplodia blight *Sphaeropsis sapinea* (=*Diplodia pinea*)	Ponderosa pine	Western Montana	This pathogen was associated with branch dieback at many locations in Montana. Damage was severe at a number of locations causing tree mortality in the past 6 years.

STEM DECAYS *Phellinus pini* *Echinodontium tinctorium*	Various conifers	Throughout Montana	Stem decay fungi destroyed large volumes of wood, particularly in old-growth stands. *Phellinus pini* was most damaging to lodgepole pine and western larch, and *Echinodontium tinctorium* caused major losses in grand fir and hemlock stands.
FOLIAGE DISEASES			
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Western Montana	Elytroderma was chronic at certain locations, including the Bitterroot Valley, the Flathead Indian Reservation, around Flathead Lake.
Larch needle blight *Hypodermella laricis*	Western larch	Western Montana	Larch needle diseases increased in severity in local areas of western Montana.
Larch needle cast *Meria laricis*	Western larch	Western Montana	Larch needle diseases increased in severity in local areas of western Montana.
Lodgepole pine needle cast *Lophodermella concolor*	Lodgepole pine	Western & central Montana	Lodgepole pine needle cast was widespread but less severe throughout western Montana and northern Idaho. Affected growth tests in several Tree Improvement plantations.
Swiss needle cast *Phaeocryptopus gaeumannii*	Douglas-fir	Western Montana	Swiss needle cast occurred at endemic levels in western Montana where it limits Christmas tree harvests.
VASCULAR WILTS AND DECLINES			
Dutch elm disease *Ceratocystis ulmi*	American elm, Siberian elm	Eastern & central Montana	Dutch elm disease continued to spread in urban areas in urban areas in North Dakota and Montana. Montana's highest losses occurred in Billings and Great Falls.

NURSERY DISEASES

Fusarium root rot *Fusarium* spp.	Douglas-fir, Other conifers	Private nurseries	Fusarium is typically the most common nursery problem.
Gray mold *Botrytis cinerea*	Engelmann spruce, Lodgepole pine, Western larch	Private nurseries	
Sirococcus tip blight *Sirococcus strobilinus*	Engelmann spruce, Ponderosa pine	Private nurseries	

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COMMON AND SCIENTIFIC NAMES

Diseases

Annosus root disease	*Heterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink
Atropellis canker	*Atropellis piniphila* (Weir) Lohm. and Cash
Brown cubical butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Comandra rust	*Cronartium comandrae* Peck.
Diplodia blight	*Sphaeropsis sapinea* (Fr.) Dyko.
Dutch elm disease	*Ceratocystis ulmi* (Buism.)
Dwarf mistletoes	*Arceuthobium* spp.
Elytroderma needle cast	*Elytroderma deformans* (Weir) Darker
Fusarium root rot	*Fusarium oxysporum* Schlect.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Larch needle blight	*Hypodermella laricis* Tub.
Larch needle cast	*Meria laricis* Vuill.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Lodgepole pine needle cast	*Lophodermella concolor* (Dear.) Dark.
Pini rot	*Phellinus pini* (Thore:Fr.) Pilet.
Sirococcus tip blight	*Sirococcus strobilinus* Preuss
Swiss needle cast	*Phaeoeryptopus gaeumannii* (Rohde)
Western gall rust	*Endocronartium harknessii* (Moore) Hirat.
White pine blister rust	*Cronartium ribicola* Fisch.

Insects

Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Douglas-fir tussock moth	*Orygia pseudotsugata* (McDunnough)
Gypsy moth	*Lymantria dispar* (Linnaeus)
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Pine engraver beetle	*Ips pini* (Say)
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Western spruce budworm	*Choristoneura occidentalis* Freeman
Western pine beetle	*Dendroctonus brevicomis* LeConte
Fir engraver beetle	*Scolytus ventralis* LeConte
Leaf roller	*Archips negundanus* (Dyar)
Lodgepole terminal weevil	*Pissodes terminalis* Hopping

RECENT PUBLICATIONS

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